

# SCIENCE

FRIDAY, JANUARY 27, 1888.

THE GROWTH OF SCIENCE is well illustrated in the recent appearance in the *Century* of the series of articles on the new astronomy by Prof. S. P. Langley. These have been republished in book form by Messrs. Ticknor & Co. of Boston. We now have a new chemistry, a new physics, and a new astronomy; and, owing to the way in which the older brothers or older sisters have been endowed, these new-born sciences find themselves without the pecuniary means for their proper support. To quote from Professor Langley's preface, it is not generally understood that among us not only the support of the government, but with scarcely an exception every new private benefaction, is devoted to the old astronomy, which is relatively munificently endowed already, while that which he has called the new, so fruitful in results of interest and importance, struggles almost unaided. The great national observatories, like Greenwich or Washington, are the perfected development of that kind of astronomy which was only interested in recording the movements of the solar system. From primitive times man knew where the sun would rise on a certain day; and the record of this knowledge is left us in the prehistoric buildings, if such they may be called, of Britain. At Greenwich the moon has been observed, with scarcely an intermission, for a hundred and fifty years, but not for the purpose of seeing what it was made of, but for the purpose of forming the lunar tables, which, by means of the moon's place among the stars, will give the navigator his positions. In the same way at the Washington observatory one may see a wonderfully exact instrument strongly bolted to massive piers, and so immovable that the sun can be observed by it but once daily as it crosses the meridian. This instrument is the complete attainment of that long line of progress in one direction of which the prehistoric stones at Stonehenge mark the initial step,—the attainment, that is, purely of precision of measurement. The new branch of astronomy, which has had its entire growth within a few years, studies sun, moon, and stars for what they are in themselves and in relation to ourselves. Its study of the sun, beginning with its external features, led to the further inquiry as to what it was made of, and then to finding the unexpected relations which it bore to the earth and our own daily lives on it. This new branch of inquiry is what Professor Langley calls the 'new astronomy;' and it is for this new astronomy—this study of the celestial bodies to find out their nature and their relation to us, rather than for the purpose of simply recording their relative motions—that Professor Langley has made so beautiful and so eloquent an appeal for the proper endowment of this new field of research. No one can read this book of Langley's without feeling that astronomy has acquired an entirely new interest for him. It now results in something more than the dry-looking pages upon pages of tables.

THAT THE ORIGIN of color-blindness lies in the brain, and not in the eye, has been suggested by Professor Ramsay. While engaged in teaching in Brooklyn some years ago, the principal of a school insisted in treating every case of the sort as dependent on the will of the pupil. His remedy was the rod. This certainly seemed a tyrannical and unwarranted treatment, but the result was favorable to his theory. Is it possible that a thorough examination will ultimately demonstrate that the fault lies very largely in the shiftless methods of observation which have grown up under the old classical system of education, and which have to a large extent

become hereditary? Professor Ramsay's suggestion and his argument deserve careful attention, and, if found correct, we have another and overwhelming reason for the newer education. At first sight, it is not perfectly clear, on the above theory, why it is that color-blindness should be more common among men than among women; yet it is possible that this will be found to bear out the suggestion made above, for, with the discontinuance of the wearing of colors by the men, their interest in colors to a large extent must have ceased; and if our old methods of education were to be continued much longer, it may be, that, with the less use of color by women in their dresses, an increase of color-blindness might result among them as well. It is doubtful, however, whether the introduction of the rod as a quick corrective will find many advocates.

## VOLAPÜK.

THIS is the name of an artificial language recently devised for international use. Similar attempts have been made at various times to produce a vehicle of uniform expression for the world's speakers; but modern literature knows nothing of these efforts. All have been abortive. Will Volapük be more successful?

A universal language must have a phonetic representation—a 'real character'—that shall be easily and uniformly intelligible to all readers. The new candidate for universality is in the mean time unprovided with any international medium of writing. It cannot, therefore, while this want is unsupplied, be diffused as a spoken language. Take, for example, the title 'Volapük.' The English reader deciphers this word into the syllables 'Vol-a-puk,' with customary sounds; but the intended pronunciation is 'Voh-lah-puek.' A French or a German reader would have no difficulty with the syllable 'pük,' but the English system of letters can give our readers no idea of the sound. The employment of Roman letters, while they have such diverse phonetic values in different languages, must effectually prevent the oral use of Volapük in different countries. As a written language it might still, however, be of service.

Is Volapük the best language that science can create for this ideographic purpose? Is it superior to previous essays of the same kind? The most elaborate and complete of all earlier schemes for a universal language is undoubtedly that of Bishop John Wilkins. This system was printed for the Royal Society in 1668. The analysis and the classification of ideas, on which the 'Philosophical Language' is founded, are beautifully ingenious. A similar principle of arrangement was afterwards adopted by Dr. Roget in his well-known 'Thesaurus of English Words and Phrases,'—a book, by the way, which owes its existence to the labors of Bishop Wilkins, although no acknowledgment of such indebtedness is to be found within its pages. The bishop's scheme for a universal language is indeed referred to, but only as having been "soon found to be far too abstruse and recondite for practical application;" while no mention is made of the grand feature of the work, on which the whole scheme is based,—the fundamental grouping of thoughts and expressions. This feature is simply, silently appropriated in the 'Thesaurus.' The latter is a very cleverly executed work; but the credit of its plan, however improved by Dr. Roget, should have been ascribed to the original designer, Bishop Wilkins.

Before examining the details of Volapük, let us look at some of the characteristics of the older scheme. The complete categories of ideas are comprised under forty 'genuses or heads,' to each of which a radical sign is appropriated. This sign is susceptible of the addition of subordinate marks, which, on defined principles, signify species, differences, etc. The resulting geometrical figures make up the 'real character.'

The application of the system is illustrated in the Lord's Prayer

and the Creed. The signs for the ideas 'heaven' and 'earth' are thus explained:—

"[*Heaven*] This Generical Character is assigned to signifye World, the right angled affix on the left side, denoting the second Difference under that Genus, namely Heaven; and because there is no affix at the other end, therefore doth it signifye the Difference itself, and not any Species."

"[*Earth*] The same Generical Character signifyng World, the affix making a right Angle, doth denote the second difference under that Genus, namely the Celestial parts of it in general, amongst which, this Globe of Sea and Land whereon we live, is reckoned as the seventh Species, denoted by the affix at the other end."

These examples suffice to show the nature of the 'real character,' which is obviously adapted for universal writing, because the ideas expressed by the signs are translatable into the words of any language.

The Roman alphabet (with additional letters) is also made use of in application of the system to individual languages. The same forty 'genuses' are expressed by simple syllables, such as *ba, be, bi*, etc.; the differences under each genus being denoted by sequent consonants, as in *bab, bag, bad*, etc.; and the species by putting a vowel after the consonant, as in *deba, deta, gade, pida*, etc.

A few words may be quoted to show the nature of the verbal forms in this 'philosophical language:—

<i>al</i> = 'the'	<i>lal</i> = 'from'	<i>odab</i> = 'body'
<i>coba</i> = 'father'	<i>lil</i> = 'at'	<i>odad</i> = 'hell'
<i>cobas</i> = 'son'	<i>me</i> = 'as'	<i>poto</i> = 'day'
<i>Dab</i> = 'God'	<i>mi</i> = 'no'	<i>Saba</i> = 'Lord'
<i>dad</i> = 'heaven'	<i>na</i> = 'and'	<i>salba</i> = 'kingdom'
<i>e</i> = 'he'	<i>nil</i> = 'but'	<i>tado</i> = 'power'
<i>he</i> = 'his'	<i>nor</i> = 'for'	<i>velco</i> = 'lead'
	<i>velphi</i> = 'give'	

The principle on which these words are constructed may be understood from the author's explanation of the four following:—

"[*Coba*] Co doth denote the Genus of Oeconomical Relation; the letter [b] signifyng the first difference under that Genus, which is Relation of Consanguinity; the vowel [a] the second Species, which is direct ascending; namely, Parent."

"[*Cobas*] The syllable [co] is assigned to the Genus of Oeconomical Relation, the letter [b] to the first difference, and the vowel [a] for the second species, the Letter [s] denoting the word hereby signified, to be an Opposite, viz. Son."

"[*Dad*] Da the Genus of World, and [d] the second difference, which is Heaven."

"[*Odad*] [Da] is the Genus of world, [d] is the second difference, which is Heaven, the vowel [o] which is opposite to [a] being prefix, denotes this to be the word opposite to Heaven, viz. Hell."

In this way all thoughts find expression in fit words deduced from the associated meanings of their component letters. "Every Word being a description of the thing signified by it; Every Letter being significant, either as to the Nature of the Thing, or the Grammatical Variations of the Word; besides the constant Analogy observed in all kinds of Derivations and Inflexions." With all these advantages, however, the philosophical language would need a philosopher to use it.

Another part of Bishop Wilkins's work ought not to pass unnoticed; namely, his analysis of English sounds. This is far superior to that of any preceding writer, and also more complete than the schemes of the majority of subsequent phoneticians. If the bishop's scheme for a universal language must be set aside as being beyond the ability of average learners, the logical, grammatical, and phonetic principles evolved in its development must always command the admiration of students.

The new claimant for adoption as an international language proceeds on the principle of selecting roots of words from the vocables of existing languages; but the relation of the Volapük words to the English, German, French, and other words from which they are derived, is so far from obvious, that the learner is not assisted by it to remember the meanings associated with the roots. English is said to have furnished about forty per cent of the adopted roots, yet, in a vocabulary extending over upwards of forty pages, only twelve of the roots exactly correspond with their English proto-

types. The roots might, indeed, just as well have been entirely arbitrary as to have been arbitrarily chosen in this fashion from existing words. The method of root-building proposed by Bishop Wilkins seems greatly preferable.

Root-words having been selected, they are provided with a very complete and on the whole simple category of definitive letters and syllables, for prefixing or suffixing, to show number, gender, case, tense, mood, etc. The simple grammar of English has not been taken as the model in this department, but the complex arrangements of highly inflected languages. This is unfortunate; for we may safely assume that the universal language to be some time adopted will express all verbal relations by separate words, and not by root-inflection. The student will then need only to memorize words, and he will not require to know any thing of case-endings and other grammatical subtleties. On the other hand, if these matters are considered essentials of a language, the inflective scheme of Volapük could hardly be improved on. For example: all plurals end in *s*; final *-a* denotes the possessive case, final *-e* the dative, and final *-i* the objective; masculine genders end in *om*, and feminine in *ji* (pronounced 'she'); adjective terminations are *ik* and *id*, adverbial *o* and *na*, degrees of comparison being *um ün*, and *umo üno*; active and passive verbs have their appropriate signs, as have also all persons, tenses, and moods; prepositions end in *ü*, interjections in *ö*, etc. The grammatical particulars to be attended to are very numerous, but the rules have the advantage of being absolute, and unburdened with exceptions. The inflective feature of the language must, however, present an unsurmountable obstacle to its popular employment.

We cannot think that Volapük solves the problem of a universal language. The system will naturally meet with the largest acceptance in countries which already possess an inflected language; for the manifest superiority of the Volapük inflections, in regularity and simplicity, cannot but impress those accustomed to the complexities and anomalies of inflection. Speakers of English are happily free from this source of difficulty, and to them Volapük cannot be acceptable. The English language is itself reaching out towards universality, under the influence of commercial and social necessities. The present form of the language may be considered as classical, and must be allowed to remain substantially what it is. But English is undoubtedly susceptible of modifying simplifications which would easily and perfectly fit it for international use. Let a committee be appointed, consisting of one British and one American member, to investigate the subject, and suggest such changes as would remove anomalies, and I feel convinced that they would readily create a new and simple tongue in the form of what may be called 'world English.' This seems to be the most hopeful direction in which to look for universal language.

ALEX. MELVILLE BELL.

#### THE PEOPLES OF SOUTH-EASTERN EUROPE.

At the present time, when the idea of 'nationality' rules the fates of Europe, those states have to pass through the severest struggles which have the most heterogeneous population, the parts of which gravitate to different centres. This is particularly the case in Austria, and was the case in Turkey. The latter, however, has disintegrated to such an extent that many of the peoples formerly included in its territory have gained their independence.

The accompanying map shows the distribution of the peoples and the boundaries of the states of south-eastern Europe. At the present time, when the struggles of the Bulgarians for independence and unity excite so much interest, a description of their distribution is of particular importance. The map shows that they inhabit the greater part of Bulgaria, while in the eastern part Turks are intermingled with them. Eastern Roumelia, which by the uprise of 1886 joined Bulgaria, has a Bulgarian population in its western half, while numerous Turks inhabit the east, and Greeks occupy the coast. But the territory of the Bulgarians is not confined to these two districts, which practically form one state. The south-eastern portion of Servia and ancient Macedonia is inhabited by them, and their territory extends northward to Ochrida. Their western neighbors are the Servians, of whom the Croatsians and Slovenians form a branch. The map shows that they occupy the

western part of this region from Montenegro and Servia north-westward, their greater number being under Austrian rule. While these peoples immigrated during the middle ages, numerous remains of the ancient inhabitants of south-eastern Europe are still extant, although in course of time much influenced by the immigrants of the middle ages. The most important of these are the Greeks in Greece and the adjoining parts of Turkey; on the Archipelago, Crete, and on many points of Asia Minor. Their distribution all around the coasts of the Ægean Sea and on the south-west coast of the Black Sea shows that they are principally a seafaring and trading people. Colonies of Greeks are found in all great cities of the Orient. Their neighbors are the Albanese, who live in the rugged mountains of the western part of the Balkan Peninsula, east of Montenegro. They are presumably descendants of the ancient Illyrians, although much doubt prevails as to their descent. In southern Eubœa and around the Gulf of Ægina they live among Greeks.

During the reign of the Romans over eastern Europe many peoples became Romanized. Their descendants are the Roumenians in Roumania, Bessarabia, Transylvania, eastern Hungary, and the north-eastern corner of Servia. It is of interest that a number of them, widely separated from the main body, should live in the Pindus, near Berat, and in a few villages of eastern Thessalia.

The invasion of the Turks added a new element to these peoples, but there are only few places which are inhabited by them exclusively. Their principal territory in Europe is the eastern part of the Balkan Peninsula, between the mouths of the Danube, Philippopolis, and Constantinople; but, besides this, numerous isolated districts throughout the peninsula are inhabited by them. The number of Turks, however, in the outlying districts, which are not any longer under Turkish rule, has greatly decreased since the recent wars. The principal district of the Turks is Asia Minor.

In the north-western part of south-eastern Europe we find another foreign people settled among the Indo-Europeans, — the Hungarians, who belong to the Finno-Tartarian race. They occupy the greater part of Hungary, where Germans, Servians, Roumenians, Russians, and Slovenians are settled among them, and the eastern part of Transylvania. Last of all we mention the Germans, who are the neighbors of the Hungarians and Servians in the north-west, but have, besides, numerous colonies in Hungary, Transylvania, and near the mouths of the Danube.

The development of these numerous peoples is one of the interesting problems of European history. It is hardly possible to classify the peoples who in ancient times lived in these regions. During the middle ages numerous peoples — the Gauls, Romans, Goths, Huns, Avars, Petchenegs, and Cumans — invaded the peninsula; but the principal part of the population consists of the ancient Slovenes of Pannonia, who settled in course of time in the province of Moesia. About the middle of the seventh century we hear about their wars with the Byzantine empire. The most important event in the early history of the southern Slavic peoples is the invasion of the Bulgarians. Their descent is doubtful, for their language has been lost. Gaster points out that not only the relics of Bulgarian language, which consist mostly of proper names, but also certain customs, are in favor of the theory that they belonged to the Turkish peoples who ruled in southern Russia, and that with them came certain Finnish tribes. They crossed the Danube in 679 A.D., and in course of time subjected all peoples of south-eastern Europe. Within a few centuries they became amalgamated with the Slavic people, whom they had conquered, and thus formed the Bulgarian people of the present time. We need only to mention that the Turkish invaders found all these peoples settled, and added a new element to the numerous races and peoples of that region.

From this brief review of the facts it will be seen that there exists no homogeneous people in south-eastern Europe, but that all of them are the descendants of an extensive mixture of different peoples. Even the Greeks, whose language has comparatively little changed since the times of antiquity, have been greatly influenced by Slavic peoples.

As none of the states of this region comprises a population speaking only one language, and as at the present time the history of Europe is entirely ruled by the desire of each nation to be inde-

pendent, the natural outcome of this state of affairs is a continuous struggle between the various peoples. But a glance at the map shows that the actual distribution of the peoples makes the establishment of states comprising only one people impossible. A Greek empire would exclude all other peoples from the sea; a Bulgarian state would include numerous Greeks, Turks, and Albanese. It is of great interest that these difficulties have only arisen in our century, for before this time the idea of nationality was hardly known. It is only since the French revolution that the tendency of all peoples speaking one language to form one state has grown up. To this idea Italy and Germany owe their existence, and it threatens Austria and Turkey with destruction. It is remarkable to see how people bitterly opposed to one another, not on account of diverging interests, but on account of difference of language, in Europe, become merged in our continent into one great people; how the same process that has been going on in Europe so frequently during the middle ages, but only by means of wars, is going on peaceably in America. Our map shows that so long as the same ideas and interests remain the leading ones in the history of south-eastern Europe, there is a constant source of wars and minor troubles, even aside from the contending interests of Russia and Austria to gain a foothold on the Ægean Sea, and England's fear of Russia's commanding the entrance to the Black Sea.

#### VALUES IN CLASSIFICATION OF THE STAGES OF GROWTH AND DECLINE, AND PROPOSITIONS FOR A NEW NOMENCLATURE.

At the meeting of the Boston Society of Natural History, Nov. 16, 1887, Prof. Alpheus Hyatt presented a paper, of which the following is an abstract. He proposed, in accord with views previously published in his 'Larval Theory of the Origin of Tissue,'<sup>1</sup> and an abstract of the same subsequently printed in the *American Journal of Science*, May 31, 1886, to divide the animal kingdom into three comprehensive divisions: (1) *Protozoa*, unicellular animals, which propagate by means of asexual (autotemnic) fission and by spores, and build up colonies, but always remain typically unicellular; (2) *Mesozoa*, multicellular colonies, but composed of only one layer of cells, so closely connected that they form a layer of primitive tissue. They have more or less spherical forms, and propagate by means of ova, spermatozoa, and by autotemnic fission, and have an aula or common cavity, but no specialized digestive cavity or archenteron; (3) *Metazoa*, complexes of multicellular colonies, in which growth by sexual union and resulting fission of the ovum form three primitive tissue layers, and build up a body in which an archenteron is always developed, they propagate always by means of ova and spermatozoa, autotemnic fission occurring only, if at all, during the earliest stages of the ovum.

The stages of holoblastic ova may be in a general way classified as follows, to accord with that given above for the animal kingdom: —

(1) The ovum or monoplast (Lankester); (2) the first stage of segmentation, which normally results in the production of two cells, the *Monoplacula*; (3) the second stage of segmentation, in which two layers arise, the *Diploplacula*. The first two stages alone seem to have parallel or representative adult forms among *Protozoa*. He proposed to classify these stages under the name of 'protombryo.'

(4) The blastula is in aspect and general characteristics the morphological equivalent of the adults of the genera *Volvox* and *Eudorina*, the types of the *Mesozoa* or *Blastrea*. The latter are animals in which growth remained permanently arrested at the single-layered, spherical stage in the evolution of tissue-building forms. He proposed to classify these stages under the name of 'mesembryo.'

(5) The gastrula can be compared, as has been done by Haeckel, with the lower *Porifera* (*Ascones*), but these have three layers like the lowest *Hydrozoa*, in which a three-layered gastrula-like stage has been permanently preserved. The proper name for these stages would therefore be 'metembryo,' in allusion to the fact that the ovum at this stage was probably essentially a metazoon, or a near approximation to this type.





**Ethnological Map of Southeastern Europe.**

According to H. Kiepert.

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(6) The first and simpler planula stages, though often characteristic of the larger divisions of the animal kingdom, do not possess, as a rule, the essential, diagnostic characters of the larger divisions to which they belong, and he proposed to call them 'neoeembryos.' Examples: the *Cinctoplanula*, the planula of the *Cœlenterata*, the *Pluteus*, the *Trochosphere*, the *Pilidium*, the earliest planula-like ciliated stages of *Amphioxus*.

(7) The latest of the more specialized planula-like stages are either directly transformed into, or else give rise to, other forms in which the characters of the larger divisions or types of the animal kingdom begin to appear, at least so far as essential characters are concerned. Examples: the *Ascula* and *Ampullinula*, the *Actinula*, the *Gulinula*, the *Veliger*, the internal worm-like form arising in *Pilidium*, the stage of the formation of the notochord in *Amphioxus*. He proposed, therefore, to interpret these relations by naming the embryo in these stages the 'typembryo.' This term can be applied to the *Nauplius* of *Crustacea*, and the *Echinula*<sup>1</sup> of *Echinodermata*, as well as to those above noted.

The application of such principles to the study of the younger stages of fossil *Cephalopoda* was productive of what seemed to be satisfactory results. The protoconch of Owen is, according to this nomenclature, a shell of a univalve *Veliger* among the cephalous *Mollusca*, and a typembryo, which, though eminently characteristic of that group, has no exact morphological equivalent among normal adult forms of recent or fossil shells.

The true larval, or, as they are here named, silphologic (Σιλφη, 'a grub') stages began with the formation of what Owen appropriately called the apex of the conch or true shell. Among nautiloids this was a short living chamber occupied by the body of the animal, but having no siphon or septum. It was completed by the deposition of the apical plate, which sealed up the aperture of the protoconch, thus closing the opening, and cutting off communication between the two interiors. This stage can therefore be named the 'asiphonula' or siphonless larva.

The second larval stage in *Nautiloidea* was composed of a living chamber, closed apically and completed by a single septum, which had a cæcal prolongation reaching across the first air-chamber and resting upon the inner side of the cicatrix. It is proposed to call this stage the 'cæcosiphonula,' since it is undoubtedly the primitive stage of that organ. The cæcosiphonula may indicate the former existence of an ancestral form having a central axis composed of similar closed funnels or cæcal pouches.

The third silphologic stage in nautiloids was completed by a septum (the second in the apical part of the shell) having an open funnel extending apically and joined to a loose-textured siphonal wall which reached down into and lined the cæcum, thus forming a secondary closed tube. In accordance with the structure, this has been named the 'macrosiphonula.'

The fourth larval stage of the nautiloids was completed by the building of the third septum. This septum had a long funnel and attached porous wall, but this wall formed a true siphonal tube opening apically into the next section, the macrosiphon. This was the beginning of the small siphon, and can be appropriately termed the 'microsiphonula.' The microsiphonula was the typical stage of nearly all the known genera of nautiloids, beginning with the *Orthoceratites* of the Cambrian, and found at the present time in *Nautilus*, and also of all ammonoids and belemnoids without exception.

It has also been found in tracing the descent of forms within sub-orders, families, and genera, that it is practicable to prove, that characteristics usually appear first in adult stages, and are then inherited at earlier and earlier stages in successive species of the same stock, whether they occur on the same horizon or in different horizons. The adolescent stages are therefore of as great importance for tracing the genealogy of small groups as are the silphologic characters in larger groups. Thus one can speak in definite terms of the relations of the nealagic (Νεαλγς, 'youth-

fulness') stages, and their meaning, and importance in tracing the genealogy of families and genera, without danger of confusing them with the characters of any of the silphologic stages.

After the silphologic and nealagic stages have been disposed of, there still remains the adult period, which is equally important in genealogical investigations, since it enables the observer to study the origin of many characters which afterwards become silphologic and nealagic in descendant forms.

The use of a distinct term for the adult period becomes necessary not only on this account, and to separate its relations from those of preceding periods, but also because of the constant recurrence and importance of representative forms. The term 'ephebology' ('Εφηβολος, 'the age of puberty') has accordingly been adopted for the designation of the relations of the adult stages, and under this term can be classified also the representation of similar forms in different groups or morphological equivalents. These are often so exact that it becomes very difficult to separate them. They have been and will continue to be the most difficult and misleading obstacles to the student of genealogy and classification.

In former essays the senile transformations and their correlations with the degraded forms of the same groups have been described and defined by the term 'geratology' (Γερατος, 'old age').

There were two stages of decline or old age among ammonoids. The first of these is the clinologic (Κλινω, 'to incline downwards') stage. This immediately succeeded the ephebic stage, and during its continuance the nealagic and ephebic characteristics underwent retrogression. Ornaments, spines, and sutures degenerated and lost their angularity; the ribs or pilæ, and often the keel and channels, when these were present, became less prominent; and before this period closed, the whorl itself sometimes decreased; showing that degeneration in the growth-force of the animal had taken place. In man the baldness of the head, loss of teeth and resorption of the alveoli, loss of the calves and rotund stomach, and return of early mental peculiarities, are phenomena of similar import.

The last changes in the ontology of the animal took place in what can be called the 'nostologic' (Νόστος, 'a return') stage, and during this period these tendencies reached their highest expression. Among ammonoids the ornaments were all lost by resorption, the whorl became almost as round and smooth as it was in the silphologic stage, and in extreme cases it even separated from the next whorl, leaving a perceptible gap. This almost complete reversion to the aspect of the silphologic stage can of course only occur in animals which attain an extreme age.

## MENTAL SCIENCE.

### Aphasia.<sup>1</sup>

IN 1861 Broca suggested before the French Society of Anthropology that the only method of determining the functions of the brain was to co-ordinate marked symptoms during life with the lesions found in a post-mortem examination. Some months later he announced his belief that the third frontal convolution of the left hemisphere of the brain was the seat of spoken language, and described a case of a patient called 'Tan' because that was the only word he used, helping himself out with various gestures. He had no paralysis, and seemed to understand what was said to him. The posterior half of the second and third left frontal convolutions of the left hemisphere was the seat of the organic lesion. In the same year a quite similar case of a man with only such scraps of words as 'oui,' 'no,' etc., but with mental and motor powers intact, showed in the autopsy a definite lesion in the third frontal convolution of the left side of the brain. These remarkable cases drew attention to diseases of this kind; and in the end of 1863, eleven cases were on record in which the power of vocal speech was almost or entirely lost, the common anatomical element of each of which was a lesion in the posterior third of the third frontal convolution of the left hemisphere. Broca called this condition 'aphemia,' and gave as its symptoms the loss of the power to express ideas by vocal movements without any motor paralysis or mental impairment. He concluded that memory was not a single

<sup>1</sup> Abstract of an address delivered before the Anthropological Society at Paris by M. Mathias Duval, *Revue Scientifique*, Dec. 17, 1887.

<sup>1</sup> Address at the American Association by Alexander Agassiz, vol. xxix. 1880, p. 410 reprint, p. 22, shows that there is a stage of the embryo common to all orders of living *Echinodermata*. This stage, however, was not named in the address above quoted, which was intended as preliminary to an illustrated essay on the same subject; and Mr. Agassiz has supplied that omission in the following note, which I quote from a letter to me: "I intended some time, when revising my 'Address on Paleontological and Embryological Development,' to call the earliest common stage of echinoderm embryos, 'Echinula,' for convenience in making comparisons. — A. AGASSIZ."

faculty, but that the memory of each kind of mental acquisition was separately organized, and that the cerebral seat of the memory for motor speech-signs was in the third frontal convolution of the left half of the brain. The most startling fact about this discovery was the association of the malady with a lesion in the left half of the brain only. Broca explained this by taking into consideration that we were all organized with a preferred side of the body, and that to be right-handed means nothing else than to have one's best-developed motor centres in the left half of the brain, inasmuch as the fibres cross over in their descent from brain to muscles. In the same way our speech-movements get associated with the left hemisphere; and in left-handed persons the reverse condition may be expected to occur, and has since been found.

Trousseau substituted the word 'aphasia' for the disease, leaving Broca's term to denote that particular form of it which he brought to notice: for it was soon afterwards observed that with the loss of speech sometimes went the loss of writing as well, and sometimes not; that, again, the power to write may be lost, and that of speech retained. Other patients could speak and write, but not read; and others, again, could read, but not speak or write. A complexity of symptoms variously combined have arisen in which order is now to be put. Four types can be distinguished:—

*First Type.*—In describing such types, it should be noted, general and typical symptoms alone can be noticed. The patient, perhaps as a sequence to an apoplectic stroke, sinks into a condition apt to be mistaken for a condition of deafness and idiocy; but careful observation soon shows that he is sensitive to noises, such as the opening of a door, and even hears the sounds of the human voice. Inferring that he is spoken to, he may attempt to answer, but will say something entirely irrelevant. Gradually appreciating that he is not speaking to the point, he may with some impatience ask you why he cannot understand what you say. He thus shows his ability to express his thoughts, to hear perfectly, and, besides, he reads and writes, plays chess, and is able to do every thing but understand spoken words. Your speech is as an unknown language to him,—just so much sound. What he has lost is the power to get meaning out of sounds; the slowly acquired associations between the word-sound and the idea are broken down; his memory for word-meanings is lost. He is not deaf to sounds, but deaf to words,—a 'verbal deafness,' as it is called. We have thus a memory for the meaning of the sounds of words, having its centre in the first temporal convolution of the left half of the brain, and losing its function when that region suffers degeneration.

*Second Type.*—Here, again, the cause may be an apoplectic stroke, which, after the immediate effects have passed off, leaves the patient in an apparently normal condition. He may prepare to attend to his business affairs; will perhaps sit down to write a letter; does so, and, remembering that he omitted something, takes the letter out to read it again. To his surprise, he cannot do so. He takes out his account-books, and finds he cannot read them; he picks up the newspaper, and again it says nothing to him. This patient hears, understands, and speaks: he is not aphemic in Broca's sense. Moreover, he can write; but his writing shows that it was written as though writing in the dark, guided by the muscle-feelings of the hand alone. He cannot read what he has just written, nor can he write from copy. His own name, that has been well impressed upon his motor centres, he writes very well, but he cannot read it. A book or a manuscript is to him as though it were written in Chinese. The disease here, then, is in the loss of the memory for the visual word-signs: the patient is not blind, but 'word-blind.' The remembrance of the forms of letters as retained by the movements executed in making them is intact, the lesion being a purely visual one. The brain lesion in such cases is quite definitely made out. It is in the second parietal convolution or inferior parietal lobule, behind and above the lesion in word-deafness, and, like it, is confined to the left hemisphere.

*Third Type.*—Here the patient can speak, can read manuscript or print, but he cannot write. He takes the pen in hand to write a word, knows what he ought to write, how it would look if written, but he cannot write it. He has lost the memory of the movements necessary to form the letters. The association between the movements made in writing and the word has been lost. He is not word-blind or word-deaf, but the *motor word-sense* is defective:

he is 'agraphic,' as the term goes. A more careful observation shows how closely his malady is limited to this loss. He can use his hands dexterously for all other purposes; he can even draw and copy from a drawing. He can in this way copy script or print, but he draws the letters slowly, as we would copy a Chinese word. We see, then, that the auditory, the visual, and the motor elements of the word are to some extent independent, and that the memory for one of these may be lost while the others are retained. We may expect to find a localization for the motor defect, as for the others; but, owing to the fact that the disease seldom occurs without other complications, the localization is not as certain. Yet the bulk of the evidence points to the posterior portion of the second frontal convolution as the centre disturbed in aphasia. The lesion is again confined to the left half of the brain, and, to complete the connection of this with the phenomena of right-handedness, such patients can learn to write with the left hand by submitting themselves to a process similar to that gone through with in learning to write in youth. They thus cultivate the right hemisphere of the brain.

*Fourth Type.*—This is the type described by Broca as aphemia, and now called motor aphasia. The loss here is the link between the idea and the appropriate movements of tongue, etc., necessary to make the sounds of words. Often the patient retains a few phrases used on all occasions: in one case it was 'cousin,' in another 'mon moment.' The poet Baudelaire, when thus affected, would constantly say 'cré nom.' Here the power of hearing and understanding is retained, writing and reading are intact, and speaking alone has dropped out. The lesion is in the third frontal convolution, mainly the posterior portion, of the left side of the brain.

These pathological states suggest that individual differences with regard to the prominence of these several word-memories in our minds should be discoverable, and that the brain-centre corresponding to the preferred memory should be more highly developed than the others. It has often been observed that to many persons the eye is the chief avenue of knowledge. Extreme instances of this faculty, such as artists copying portraits from memory, and calculators doing their work upon an imaginary blackboard, are well known; but, confining ourselves to the memory for written or printed words, we find an excellent type of this faculty in a case recorded by Charcot. A gentleman of great culture and experience had the power of reading pages of his favorite authors from the visual images of the printed page. Two or three readings of a passage were sufficient to fix it in his memory. If he wanted a letter in a voluminous correspondence, he at once thought of its appearance; and so, too, with regard to all visual experiences in general. For music and other auditory occupations he had no taste. The importance of the case is doubled by the fact that through disease this faculty was lost, and he had to resort to his auditory memory, and cultivate it by having things read to him, and in other ways. He could not remember what he had seen, be it words or other objects; and, in short, from being a 'visual-worded' and 'visual-minded' man, he was forced to become an 'auditory-worded' and 'auditory-minded' one. This type of mind is common, and many persons have the habit of seeing the picture of the page from which they quote, the appearance of their manuscript, and so on. Unfortunately we have no autopsies of normal persons who had been marked cases of this type, to see whether in them the second parietal convolution was especially developed. Passing to the auditory type of mind, one could again easily find extreme cases, and note many instances in which what is heard, and especially in words, is most readily and deeply impressed. Persons to whom writing is easier than speaking, whose thoughts flow off the end of their pens and not of their mouths, may be classed among the 'graphic-motor' type. Deaf-mutes are apt to develop this faculty in another direction, and think in terms of hand-movements. There remains the 'motor-verbal' type. Stricker describes himself as of this type, and tells how he thinks in terms of the muscle-feelings in the organs of articulation. Such persons talk to themselves when they think, and are well represented by a character in a French tale, who could not compose unless imagining himself formally delivering what he was dictating. Unlike the other cases, there is here some anatomical corroboration; and a collection of the brains of

lawyers, statesmen, and others, all celebrated for the fluency of their speech, shows a surprisingly large development of the third frontal convolution of the left hemisphere. The brain of Gambetta is a marked instance of the same fact. Here this convolution is so highly developed that it is actually doubled by a slight fissure in the middle, no trace of this development being found on the right side.

What is above described includes merely what is most surely and definitely known, — a vast field for future research remains open, and even now enigmas are waiting to be answered. That certain aphasic patients are unable to count, and others do so normally; that some can tell time, distinguish the beats, but cannot count; and so on, — are facts as yet without meaning. So, too, the loss of the power to express one's self in gestures, and to use the ordinary conventionalities of life, may some day find a definite cerebral localization. Sometimes only certain kinds of signs are lost, and the rest retained; sometimes the patient can talk only by singing. All these facts may, in the science of the future, be as definitely explored as the main types of aphasia are to-day.

THE PSYCHOLOGY OF HANDWRITING. — In the *North American Review* for January, the editor, Mr. Rice, prints a series of the autographs of Napoleon, written at various epochs in his eventful life. Starting in his earlier years with a bold and clear signature, it retains most of these characteristics in the days of his greatest successes; but parallel with the declining fortunes of the great man, is a degeneration of his autograph, until at the end we have nothing more than the rudest, characterless scrawl. The autographs cannot but suggest the ravaging changes in the nervous system that were the physiological concomitant of the turmoil raging in the hero's mind.

#### HEALTH MATTERS.

##### Foot-and-Mouth Disease, and its Relations to Human Scarlatina as a Prophylactic.

At a recent meeting of the New York Academy of Medicine, Dr. J. W. Stickler of Orange, N.J., read a paper entitled 'Foot-and-Mouth Disease as it affects Man and Animals, and its Relation to Human Scarlatina as a Prophylactic.' He said that it had long been known that foot-and-mouth disease could be communicated from animals to man through the milk of the affected animals, and by the introduction of the virus into wounds. When human beings are the subjects of this disease, the glands become enlarged, vesicles appear in the mouth and upon the hands and feet, and in some cases an eruption which resembles that of scarlet-fever. Hertwig and others, who purposely contracted the disease by drinking infected milk, were affected in this way. In 1884 there was an epidemic of sore throat, together with glandular enlargements and vesicles, in Dover, England. Upon investigation it was shown that it was due to the drinking of milk from animals sick with foot-and-mouth disease. Two years after this, an investigation was made in one hundred and eighty-two of the cases which had suffered from the sore throat in 1884. None of them had since had scarlet-fever, and from other points in their history it appeared that they had been rendered insusceptible to that disease. Dr. Stickler had himself inoculated three children with virus from milch-cows, and subsequently exposed them to scarlet-fever. One of these, after having fully recovered from the inoculation, was taken to the bedside of a scarlet-fever patient, and inhaled the latter's breath, and placed his head upon the pillow of the sick one. The child did not contract the fever. Two other children, similarly inoculated and similarly exposed, have not contracted the disease. In concluding his paper, Dr. Stickler said, that, while it was by no means proven that scarlet-fever could be prevented by such inoculations, the results thus far obtained were very suggestive, and proposed to continue his investigation.

In the discussion which followed the reading of the paper, Professor Law of Cornell University said that he was sceptical as to the prophylactic value of these inoculations against scarlet-fever. In Great Britain there were frequent outbreaks of foot-and-mouth disease, affecting cattle and the persons who came in contact with them, and, if it was a protective disease against scarlet-fever, he thought the latter should be much less prevalent than it was. He

had himself been over and over again exposed to foot-and-mouth disease, but had never suffered, while, on the first exposure to scarlet-fever, he contracted it; his system being susceptible to the one, and not to the other. He thought it would be dangerous to investigate this subject very much in the United States, as it would be a very serious matter if the foot-and-mouth disease should be introduced among American cattle. He also feared that scarlet-fever might be more widely disseminated if these inoculations were to be made general. While he had great respect for Pasteur, he could not help believing that he had increased the spread of anthrax by scattering abroad his modified anthrax virus, as, under favorable conditions, this weakened virus might become potent and dangerous. He considered it a fact that there had been more rabies in England since Pasteur's discovery than before; and the same danger existed in the attenuated virus of rabies as in that of anthrax.

Dr. L. McLean of Brooklyn said that there was no such natural disease as bovine scarlatina. If cows contracted the disease, it could only be by inoculation from affected human beings. He did not believe that foot-and-mouth disease was prophylactic of scarlet-fever. There had been but two outbreaks of foot-and-mouth disease in this country, — one in Maine; and one in the vicinity of New York City, extending up the Hudson as far as Poughkeepsie.

Dr. J. Lewis Smith said, "Since the time of Jenner the hope has been awakened that some of the other fatal infectious diseases, and especially scarlet-fever, might be prevented, as small-pox has been, by the substitution of a milder and modified disease, derived from the lower animals. As regards scarlet-fever, two propositions of great interest and importance have arisen: first, is there a disease in the bovine race which is true scarlet-fever, or which communicates genuine scarlet-fever to man? and, second, if there be such a disease, does it produce a mild and modified form of scarlet-fever in man? Many instances have been recorded in the last five or six years in which epidemics of scarlet-fever have arisen from the use of milk furnished by healthy cows, and infected with the scarlatinous germ after the milking; but in the St. Marylebone and Hendon epidemic, occurring two years ago, and described in the *British Medical Journal*, May 20, 1886, the outbreak of scarlet-fever appeared to be clearly traced to diseased cows. Now, the point to which I wish to call attention is this. The sickness of the cows was mild, not appreciably impairing their appetite, nor diminishing their milk, but the disease which the use of the infected milk produced is described as an 'intense outbreak of scarlet-fever.' Instead of a mild disease being propagated from the cow, for which we are looking and hoping, the reverse occurred. A mild form of the disease in the cow produced a severe one in man; so that it appears from the history of this epidemic, that, by inoculating with the bovine scarlatinous virus, we might produce severe and fatal epidemics, instead of a mild and modified form of the disease."

Dr. Stickler closed the discussion by saying, that, if he produced only a slight and harmless attack of scarlatina by his inoculations, he could see no objection to the use of the scarlatinal virus for this purpose; and, when the terrible effects of the unmodified disease were taken into consideration, he thought it of extreme importance that a method of protection should be secured if possible. As to the disease from which the Hendon cows suffered, it had, he thought, been clearly demonstrated that it was nothing else than scarlatina, since it was precisely the same affection as was ordinarily produced in cows by the inoculation of scarlatinal virus from the human subject.

THE BACILLUS OF CANCER. — Dr. Horatio R. Bigelow, in a letter from Berlin to the *Boston Medical and Surgical Journal*, expresses his conviction that Scheurlen has discovered the bacillus of cancer. This discovery is confirmed by S. Guttman and Stabsartz Schill. In every case of cancer which Scheurlen has examined, he has found the bacillus. Dr. Bigelow believes that there is a bacillus of cancer just as really and absolutely as there is one of consumption. Its morphological characteristics are not yet clearly defined, and there are many other doubts to clear up and questions to answer; but all of this can come only after many months of hard and patient labor. At a recent meeting of the Berlin Society of Internal Medicine this discovery of Scheurlen was discussed. Fraenkel regarded the methods employed by



Scheurlen as defective. From the reports of this meeting it would appear that but few of the leading men of Germany are yet ready to accept Scheurlen's claims as established.

## BOOK-REVIEWS.

*Lectures on Bacteria.* By A. DE BARY. 2d ed. Tr. by Henry E. F. Garnsey and Isaac Bayley Balfour. Oxford, Clarendon Pr. 8°. \$5.50.

THIS is an excellent translation of De Bary's 'Vorlesungen ueber Bacterien,' with a considerable number of notes in an appendix. For one who wishes a good readable account of the nature and action of bacteria, not too long or too full of technical details, this moderate-sized and well-arranged volume answers the purpose admirably.

*The Children: How to Study Them.* By FRANCIS WARNER, M.D. London, Francis Hodgson. 12°.

THIS little volume contains half a dozen lectures, delivered by request of the Froebel Society of London, by Dr. Warner, whose works on the anatomy of movement and on physical expression are widely known. The object of the lectures is to impress upon teachers and parents the necessity and importance of the scientific observation of children. The plea is admirably and emphatically urged. On the practical side there is an attempt to give a number of indications by which the physiological health and growth of children can be observed. Though these are doubtlessly useful, and when made by a skilled observer valuable, yet they are too vaguely stated to be generally applicable. A table of printed questions, with directions as to their use, would be a much safer and more useful compend to put into the hand of the ordinary teacher. Dr. Warner sketches the anatomy of the parts of the body concerned in motion, shows how they are all related to the activity of the brain, and thus become an index of mental strength or weakness, and then describes a series of postures of various parts of the body, and especially of the hand, indicative of various temperaments. He lays stress upon the indications of the nervous type of child with the practical object of teaching such children separately, as we do with the deaf, the blind, and the weak-minded. "Why, then, are the children of slight brain-defect not specially cared for, children tending to become passionate picking up bad habits and practising them, tending to criminality, or, if too feeble for that, to pauperism? . . . Now, my argument is, that we can discover such children and pick them out in a school by definite physical signs; we can point out the children not up to the average, and tending to failure from want of brain-power." This series of lectures adds to the number of indications of the time when we shall have definite knowledge of the physical and mental traits of children by which their healthy education may be guided, and their evil tendencies avoided.

*Annual Report of the Geological Survey of Pennsylvania for 1886.* Parts I. and II. Harrisburg, Geol. Surv. 8°.

ALTHOUGH Professor Lesley's staff is now quite small, this report adds four volumes to the imposing series already published by the Second Geological Survey of Pennsylvania. Many of these numerous volumes, although possessing a local interest and value as aids in economic developments, are, from the scientific point of view, simply masses of facts awaiting generalization; and it is to be hoped that the long-promised final report which is to co-ordinate these multitudinous data will soon begin to appear.

Only the first two volumes of the report for 1886 have been received. These are crowded with details of the development and production of coal, oil, and gas, but are rather deficient in features of more than local interest not previously published; and, since the data are largely of a statistical nature, even their local value must be diminished by tardy publication.

The first volume contains the report, by Mr. E. V. d'Invilliers, on the re-survey of the Pittsburgh coal-region. It is largely a summary, in one volume, of the surveys made a decade since by Professor Stevenson, Mr. White, and others. It is accompanied, however, by a new geological map of south-western Pennsylvania. Special attention is given to the principal commercial coal of the region, — the great Pittsburgh bed. Its outcrop is determined horizontally

and vertically more accurately than ever before; and the historical and statistical facts bearing upon its development, the structural lines affecting its position for mining; the stratigraphical features of the coal-measure systems above and below it; and the methods most in use for mining and transporting its product to market, — are exhibited in all desirable fulness and detail. It is easy to see that this report must prove of great practical utility to the coal-operators of the region; and the elevations above tide of the outcrop of the Pittsburgh coal-bed will be useful to oil and gas prospectors in giving them a basis from which to estimate the depth to be drilled in order to reach the geological horizons of the different oil and gas sands.

This report is supplemented by two important contributions on Pennsylvania bituminous coal mining by Mr. A. N. Humphreys and Mr. Selwyn Taylor, and is also accompanied by a memoir by the eminent and venerable paleo-botanist, Leo Lesquereux, on the character and distribution of paleozoic plants.

The second volume consists chiefly of Mr. Carll's report on the oil and gas regions. The history of development is the most complete yet published, and gives the reader a good general idea of the successive steps by which the petroleum industry has advanced from the primitive skimming of an oil-spring with a piece of bark and the restricted use of the material to medicinal purposes, to the drilling of wells three thousand feet deep, the pumping of oil over mountain and valley to the seaboard, and the flooding of the world with an inexpensive illuminant. The ancient pits or shallow wells which are found all over the oil-region, and which were undoubtedly dug to obtain oil, are discussed at some length; and the conclusion is reached that these early oil operations are due, not to the Indians, or French, or early white settlers, but to some primitive dwellers on the soil, who have long since passed away.

Short chapters on the geographic and topographic distribution of oil and gas, on the structure and stratigraphy of the productive horizons, and on the developments during 1886, are followed by a long and monotonous series of well-records, which constitute the principal part of the report. The volume concludes with a memoir on the chemical composition of natural gas by Professor Phillips, and the extended bibliography of petroleum.

*Unfinished Worlds: a Study in Astronomy.* By S. H. PARKES. New York, Pott. 12°. \$1.50.

THIS book is intended for general readers, especially those in early life, whose ideas of the province and achievements of science are generally in excess of the sober teachings of actual experience. In this we quote from the author, and, while we are ready to agree with him to a large extent, yet we feel that just as the knowledge of Columbus seemed wonderful and awe-inspiring to his crews when he predicted the coming of an eclipse, so to us appear startling the little scraps of information our new instruments are giving us of the constitution of the celestial bodies. The old astronomy busied itself with the movements, the new astronomy with the physical constitution, of the sun, the stars, the planets, and comets. While it is true that for many of us the interest in the old astronomy began to wane, the results already achieved in this new field are so novel that we may be pardoned if we are apt to exaggerate their magnitude. Mr. Parkes's book has for its main purpose the bringing-out clearly of the changing nature of the bodies filling space, and sketches the information we have of nebulae, stars, the sun, the earth, the planets, and comets. All this is well done. The book closes with a *résumé* of the different cosmic theories.

## NOTES AND NEWS.

THE January number of the *Revue Philosophique*, edited by Felix Alcan, contains articles by A. Espinas on the mental evolution of animals, by F. Paulhan on associationalism and psychical synthesis, and by Adam on Pascal and Descartes. Besides this, reviews and *résumés* of new publications are given.

— Prof. J. J. Egli of Zurich, Switzerland, who writes the biennial reports of new researches on geographical names for Wagner's annual report on the progress of geography, publishes a circular letter in which he requests authors and publishers to send him copies, or, when such is not possible, titles, of publications and of notes or papers in journals or books referring to the subject of geo-

graphical names, their meaning, origin, derivation, etc. As it is desirable that the annual reports should be as complete as possible, and as a large amount of material is scattered through American journals, and particularly through the publications of the State surveys and historical societies, which are difficult of access in Europe, American authors can materially help Professor Egli by sending him copies, or at least the titles, of their remarks bearing on this subject.

— Last autumn an attempt was made, says *Nature*, to bring live cod from Iceland to Norway on board smacks, and six thousand fish were brought over to Bergen successfully. Here, however, many of them died, on account of the basin in which they were kept until the sale could be effected being too small. This year fresh attempts will be made.

— Dr. Asa Gray has been seriously ill for some weeks.

— The second meeting of the International Copyright Association was held in Boston, Jan. 24, President Eliot in the chair. Secretary Estes announced that satisfactory progress had been made in the movement to obtain the recognition of authors' rights in their literary work. A resolution was adopted approving the principle involved in the amendments of the Chase Copyright Bill proposed by the executive committee of the American Copyright League and the American Publishers' Copyright League, and requesting Senator Chase to adopt these amendments, with such verbal changes as may be recommended by the council of this association and adopted by the committees mentioned. A resolution was also passed asking the chairman to appoint a sub-committee to confer with Senator Chase regarding these amendments. After a general discussion, in which Messrs. Houghton, Scudder, Ticknor, Ernst Lothrop, and others participated, the meeting adjourned.

— *Nature* comments on French architects as seeming to attend to the decorative rather than the useful parts of the buildings they design. The architect who designed the new medical school in Paris took so little pains about the distribution of the water-pipes, that in very cold weather the laboratories (chemistry, physiology, bacteriology, experimental pathology, etc.) are wholly deprived of water. Recently the water in all the pipes was frozen, so that not a drop of water was available in a single laboratory. Of course, every one connected with the school complains that work under such conditions is nearly impossible. The new Sorbonne will be a handsome building, but, unfortunately, the work is soon to be stopped owing to lack of money. The ornamental part of the building is finished, but the useful part has not yet been begun.

#### LETTERS TO THE EDITOR.

\* \* \* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

#### The Snow-Snake.

In a letter (*Science*, xi. No. 259) pointing out certain errors in an article on Pocahontas, referring especially to two games mentioned therein, Dr. Beauchamp says, "The children indoors were playing at *gus-ha'-eh* (or 'peach-pits'), it is said; but where the peaches came from at that early day is not explained." Yet the doctor fails to give us a hint as to the true rendering of this word, and the proper name of this game. This game was played generally with 'plum-pits,' though sometimes with small pebbles, etc.; but, as the pits were more convenient and symmetrical, they were preferred, and, being used in most cases, they gave their name to the game, namely, 'plum-pits,' or, better, 'pit-betting.'

In regard to the use of the snow-snake among Powhatan tribes, Dr. Beauchamp remarks that "it is not wise to place a Northern game so far South," evidently wholly oblivious of the fact that 'betting' with the *u-tră-hwă'-uě* ('snow-snake') was a favorite outdoor sport of the Carolinian and Virginian tribes of Iroquois, — too important offshoots of the family to be overlooked, — and who

were situated farther South than the Powhatans. The doctor should have omitted the *r* in his orthography of the word *kă-wher'-ta* (*kă-whē'-ta*), as it does not occur in the speech of the Onondagas of the present time.

J. N. B. HEWITT.

Washington, D.C., Jan. 23.

#### The 'Act of God' Once More.

MR. W. W. NEVIN'S interesting note (*Science*, Dec. 2) as to the Mexican doctrine of 'fuerza mayor' emphasizes my point. The Roman law having always been, as it still is, the law of continental Europe, it was inevitable that such American colonies as were settled from the continent should retain the doctrine of the 'act of God,' and that when the Spanish brought it to Mexico, and implanted it in a community saturated with superstition, it should have augmented quite as rapidly as its adumbration has waned with us, until even so anticipated an occurrence as the flooding of a river in a rainy season should relieve from the obligation of a contract. But United States capital and energy are speedily civilizing Mexico by building railroads within her territory, and doubtless we may expect a very considerable attenuation of the doctrine at no distant day. I do not think all of *Science's* correspondents share in the good faith of Mr. Nevin. It does not impress me, for example, as in good faith that one of them asks (*Science*, Nov. 25) whether, had a certain car-stove he specifies upset and ignited a certain train, it would have been an 'act of God;' or that another (*Science*, Dec. 16) demands whether I propose that the railways of this Republic be operated by Mexican law. But in good faith, nevertheless, will I answer both these questions. Up to the date of the latest of the five accidents I specified, no practicable means of heating cars had been invented except car-stoves. Steam-pipes from the engine had, indeed, been proposed for twenty years, but no coupler-joint had been perfected, and no means of keeping the steam from cooling, sufficient to overcome the extreme coolable surface of a pipe serving long trains in the severe weather of the mountains, or the low temperatures of the North and North-west, devised. At present, however (stimulated, in fact, by the very casualties I specified at Republic and White River), there are certainly three or four of these contrivances which have been tested and found practicable. Therefore, had your correspondent's stove overturned and partially roasted him, he would certainly have been deprived of the opportunity of asserting that he had been roasted by an 'act of God,' since the company could have availed itself of that particular progress of applied science which had invented a heating apparatus which in case of accidents would not induce combustion of the train. As to the second question, I say, No, and Yes. I proposed no Mexican laws for regulation of our own railroads, but I did question whether an already well-known rule of law limiting the responsibility of the employer for mental conditions of the employee was entirely without bearing upon a certain state of admitted facts. The common law expressly declares that there are possible conditions of an employee's mind which discharge the employer. An employee who, in ejecting trespassers, becomes vindictive, passionate, or wilful, and on that account employs a surplusage of force, so acts at his own and not at his employer's peril. I therefore suggested a question whether an entirely unforeseen and instantaneous absence of mind on an employee's part was any more within his employer's control than a burst of passion.

Again: it seems immaterial to my point that different investigators, tribunals, or commissions may receive different reports of the causes directly forwarding a casualty. A question of precedence between parallel proximate causes is always an exceedingly nice one. Indeed, the only report of a railway accident likely to be substantially unreliable is the newspaper report; and this not necessarily because the newspaper is biased against the company, but simply because newspapers are at the mercy of their reporters, precisely as railway companies are at the mercy of their employees. The reporter first on the ground takes the impressions of the bystanders, and reconciles them somehow out of his inner consciousness. The only persons present who possess the slightest actual knowledge as to the why and wherefore of the catastrophe are the employees of the company, and they are silent. They have their

duties none the less rigid in case of accident than when all goes well, and are at their posts, saving life and property, and preventing further destruction by signals, and have neither the time nor the right to instruct reporters; though, I may add, their silence is always taken as a final confession of guilt on the part of the company. Indeed, on reading the average American newspaper accounts of railway disasters, I have repeatedly found myself exclaiming, "Why did not this dastardly and murderous company complete the catalogue of its crimes by braining the survivors with crowbars, and adding to its ill-gotten wealth by impartially pillaging the dead bodies of all its victims?" I once had occasion to investigate an accident which derailed a way-train, throwing it over the double track and immediately before an express-train coming in the opposite direction, almost exactly upon the time when the express-train was due at the point where the derailment occurred. Upon the trial of a resulting lawsuit, the crew of the wrecked train testified unanimously to the fact: the company's time-table and the registers of the train-despatchers at both ends of the division (which could not have been disturbed without throwing the whole business of the road into chaos) proved it. But some passengers whom the unusual sensation of escaping from destruction had unnerved, and to whom a series of crowded and unique experiences had made a few moments seem like hours, testified that there had been ample time to flag the express-train (some of them putting the interval at several hours); and the jury unanimously believed the passengers as against the company's witnesses, and thus morally convicted the employees of perjuring themselves under orders, in order to mulct a corporation in damages. Juries from the interior do these things as regularly as the opportunities present themselves; and the excuse lies, not in the opportunity, but in the nature of things, and in the axiom that 'bigotry' and 'ignorance' are synonymous terms. But unfortunately there is no such palliation or excuse for the ready writers and composers of leaders on the staff of our great newspapers: for these are cultivated gentlemen, who know perfectly well that railway corporations avoid accidents as they avoid bankruptcy, and enforce a ceaseless and enlightened vigilance to prevent them; that railway companies do not practise small economies, do not risk bankruptcy (for a single great accident, like that at Revere, may bankrupt, as that one actually bankrupted, an entire corporation) for the sake of a few dollars, yet, knowing this, persist in telling the public that railways are careless of public rights, and indifferent to human life. To be sure, these gentlemen do not second the religious press in advising that locomotive-engineers and East River pilots read their Bibles when on duty, — a habit which would doubtless largely increase the perils of steam-transportation; but they often, as we shall see, make suggestions quite as invaluable.

On the evening of Tuesday, Dec. 20, 1887, there *was not* a bloody and terrible disaster on the Elevated Railroad in this city. A train packed with human beings *was not* precipitated into a narrow street below, crowded with men, women, and children; horses, trucks, and vans. The wheels of a particular train, upon that occasion, left the track, but the prudence and skill of the builders of the elevated structure vindicated themselves: the jar never deflected it an atom, the stout sleepers held the train, and nobody was scratched. But no one, on reading the leaders printed in the daily newspapers of this city, would have supposed that a terrible calamity had been averted. Had that entire train, full of human beings, been precipitated upon these passing men and women, horses, trucks, and vans, the daily newspapers could not have censured the Manhattan Elevated Railway Company more emphatically than they did; or drawn for the occasion more vigorous and virtuous lessons of the greed of railway corporations, and of the woes of a long-suffering public. While every practical railway man in the country must have admired the perfect and almost automatic construction which saved so much waste of life and property on that occasion, not a newspaper commended the management, but rather took an additional opportunity of vilifying railroads in general, and the Manhattan Railway Company in particular. I did not read all the eloquent leaders with which the press improved the occasion of the non-occurrence of an appalling disaster on the New York Elevated Railroad; but I remember one, that, after feelingly dilating on the ghastly picture of gore and agony which *was not* presented on that occasion, exclaimed, —

"We must require of those who undertake such responsibilities absolute security, not a pretty tolerable degree of safety. It is not enough that accidents shall not be frequent: they must be impossible. The system must be managed on the principle that there are no railroad accidents; that what are called such are due to some species of neglect, which truly competent management could and would have prevented" (*Commercial Advertiser*, Dec. 22, 1887). If the gentleman who wrote those words will continue to walk uprightly and piously before men unto his life's end, will read his catechism and endeavor to reflect its precepts in his daily gait and conversation, he will doubtless eventually proceed to a vicinage beyond this fitful fever of life where accidents are 'impossible.' I doubt if he finds it upon this poor planet. But, although perfectly innocuous to those as clever as himself, is it not manufacturing a dangerous public sentiment — and one as unpatriotic as it is dangerous — to constantly kindle and fan the impression, that, of all the necessary industries which civilization requires, the industry of maintaining a railway, or any thing that runs by steam, is a greedy and despotic power, that lives by crushing not only the bones of passengers, but the civil liberties of the people? If it is, and if it is wrong to do dangerous and unpatriotic deeds, then the gentlemen who write these feverish and furious leaders — unless they repent — will certainly never behold the land where no accidents happen. I may add, perhaps, as germane to my text, that the newspapers all appear to agree, that, if nobody was killed the other evening at Franklin Street, it was not the fault of the Manhattan Elevated Railway Company, but a genuine 'act of God.'

"In a recent number of *Science*," says the *Evening Post*, "Mr. Appleton Morgan has published an article, entitled 'The Act of God and the Railway Company,' in which he tries to palliate or even to deny the responsibility of the corporations for most of the serious railroad accidents of the past year. We have of late become quite accustomed to such pleas on behalf of the Anarchists; but when the same line of argument is invoked in favor of a railway company, by a lawyer of Mr. Morgan's standing, it is a surprise, and by no means a welcome one." I myself do not see what I have to do with the Anarchists, or the Anarchists with me. An Anarchist is one who intrudes upon the still unsettled problem of labor *versus* capital, and proposes solving it by eliminating the element of labor, and substituting cataclysm therefor. The idea of cataclysm may have suggested a railway accident, otherwise the *Post's* correspondence of ideas does not impress me as important. Proceeding: the *Post* is astonished that I should have given an account of the Forest Hill disaster at variance with the official report of the Massachusetts Board of Railway Commissioners who investigated it, saying, "We do not understand how it was possible for a writer of good standing to disregard these facts. Either he must have presumed on the ignorance of his readers, or else he never took the trouble to look into the matter itself. The latter is perhaps the more charitable supposition. But it need hardly be said that for a writer in a scientific periodical either excuse is equally weak." Doubtless the *Post* did not, at that writing, understand how anybody could prefer the report of experts to the official reports of non-experts upon so complicated an affair as a railway accident. But it ought to have had some glimmering of an idea as to how such a preference was possible, a day or so later, when itself printed prominently, and without comment, the following item: "After a number of weeks spent in the investigation of the Chatsworth train-wreck, the Illinois Railroad and Warehouse Commission has submitted to Governor Oglesby a report stating, that, in their opinion, the 'train would not have been destroyed if the bridge had not burned before the train reached it.'" Before so masterly an analysis of the casuistry of proximate causes, no wonder the *Evening Post* was speechless. The Illinois Commission found that the Chatsworth disaster would not have happened had the bridge fallen before the fated train reached it. Their Massachusetts contemporaries reported, that, had the bridge-inspector been discharged before he reported the bridge safe, the fated train would never have attempted to run over it. I do not, upon the whole, see much to choose between them. As I write, word comes that the Minnesota Board of Railway Commissioners, as if emulous to compete in usefulness with its compeers of Illinois and Massachusetts, had decreed that no upper berths in Pullman sleeping-coaches must be



made up until actually sold to passengers, which would oblige sleepy passengers either to sit up during transit through that intelligent commonwealth, or else sleep with entire indifference to the dusky porter and the possible new-comer, and sundry joint operations not, as most of us know, over-conducive to balmy and seductive repose.

What, then, we really require is not a new law, or a new custom, or a new statute, but an infallible foresight and judgment. Our newspaper leader-writers are not, unfortunately, the only gentlemen in the country who can prophesy things after they come to pass. There are plenty of gentlemen, equally competent in that regard, now employed upon the railway lines of this continent. If, however, a gentleman could be found with the much rarer gift of prophecy as to things to come before they actually transpire, I imagine that it would be difficult to name a salary he could not command from a railway company. Indeed, neglect by a railway company to secure the services of such advance prophet ought certainly to be such a negligence as would settle the company's liability entirely beyond all possible legal inference. There is nothing upon which newspaper comment is more familiar than the well-worn theme of the fallibility of human testimony: even four inspired Evangelists, they tell us, could not agree upon a given state of facts. They press this fallibility against railroad companies. Do they ever press it in their favor? That the average newspaper should experience a difficulty in conceiving that every railway accident was beyond the company's control does not amaze me; but I admit to some surprise at the following criticism upon my paper, in the *Railroad Gazette*, a most valuable and intelligent commentator, usually, upon railway affairs: viz., "At Republic, he [myself] says the man sent with a red light failed to carry it; no mention is made of the fact that two men failed in their duty to send him. Concerning Forest Hill, Mr. Morgan makes the original assertion that no appliance in the company's power to provide was lacking; which, perhaps, must be admitted as true, as a competent bridge-engineer (which the company neglected to provide) could not be called an 'appliance.'" So far from exploding, this appears to me a much stronger putting of my point than I was equal to on the facts as they reached me. According to the *Gazette*, the fault at Republic was not that the one red-light man did not go ahead, but that two officials did not send him. So, not one human brain, but two, failed to do their duty. If, as I argued, a corporation cannot control the deflections of even one human brain, how can it control the deflections, independent and coincident, of two? The fact that one man was absent-minded, I held to be beyond the power of a corporation to prevent. But the utterly unprecedented coincidence of two brains at the same moment, in the same spot, and under the same circumstances, forgetting their duty, — and that duty their identical duty to do identically the same thing, — does really seem to me to be about as nearly an absolute act of God as any case of which most experts could conceive. And, again, supposing that the inspector of bridges of the Boston and Providence Railroad was incompetent: here, again, a human brain was at fault. If it can be shown that the Boston and Providence Company knew him to be incompetent, or had discharged a competent bridge-inspector to deliberately install an incompetent one, that would have been another matter. But it does not so appear, neither does it appear that any bridge inspected by this particular bridge-engineer had previously fallen. Speaking of this unfortunate bridge-engineer of the Boston and Providence Railway Company, the Massachusetts Board of Railway Commissioners says, "This man had been in the employment of the corporation for a long series of years, his trade was that of a machinist, he had not been educated as a civil engineer, and the management had abundant reason to know that he was not qualified, and had had no opportunity to qualify himself, to do the work assigned to him with reference to this bridge." *Ergo*, had he been discharged prior to the accident, the accident would not have happened. Perhaps not. If a railway company could only foresee accidents, could know in advance just exactly when one of its bridges was going to collapse, doubtless it could avert the disaster by discharging the bridge-inspector, so that he could not report that bridge secure, so that no train would try to cross it (which would resemble, indeed, the intrepid mariner who warded off a cyclone by collaring the barometer and holding it upside down).

But, seriously, should our railway companies every now and then discharge their old, tried, and faithful employees — men "who had been in the employment of the corporation for a long series of years" — lest they should at some time or other in the future become unfortunate, unfaithful, or careless? Perhaps a man not "educated as a civil engineer" could not possibly, after having been "in the employment of the corporation for a long series of years," come to know as much about railway-bridges as if in his youth he had spent a couple of years with a tutor, or in a polytechnic college. Does not the *Railroad Gazette's* statement of the causes of the Forest Hill accident exactly carry out my own criticism; namely, that a human brain, trusted and unusually accurate, for once failed to do its work?

APPLETON MORGAN.

New York, Jan. 12.

### The Pronunciation of 'Arkansas.'

J. OWEN DORSEY's article in *Science* for Jan. 13, re-opening the question of the pronunciation of 'Arkansas,' necessitates a few words in reply.

I fear that Mr. Dorsey fails to catch the spirit of my plea for the local and historically correct pronunciation, when he dwells upon the various vowel-sounds of *a*, and accuses me of pleading for 'consistency' in the pronunciation of this most inconsistent Anglo-American language of ours. Such an act upon my part would certainly be in opposition to my favorite hobby of observing and collecting data upon the differentiation in orthography, pronunciation, and vocabulary, under climatic and industrial conditions, of the English language in the United States.

The broadening of *a* into *aw*, the Indian origin, and the euphony of the word to foreign ears, are questions of the least import in the pronunciation of the word 'Arkansas;' for the first of these is probably French-Indian or a secondary climatic change visible in hundreds of other words, such as 'Wabash,' 'Ouachita,' 'Waukeshah,' etc., and which neither Mr. Dorsey nor I, nor any one else, can stop, more than we could put a brake upon any other evolutionary biologic or linguistic process. The evil effect that would follow the use of individual choice in the euphonious pronunciation of geographic terms is self-evident; and, since these Indians had no phonetic method of recording their tribal names, we must seek the approximately correct pronunciation of the word 'Arkansas' in the French language, in which it was first phonetically recorded. Surely, Mr. Dorsey cannot find there any authority for the pronunciation of the final syllable 'saas,' or omission of the final *s*. Certainly none of the examples given by him would authorize this, nor any of the following historical methods of spelling the word, which Mr. Dorsey seems to have overlooked: Joliet (1672), 'Kansa;' Hennepin's map (Utrecht, 1697), 'A Kansa;' Dumont de Montigny's map (1753), 'Arcanças;' Le Page du Pratz (1758), 'Arcancas;' and many other later French writers, 'Arkansas;' all of which, in good French, can only be pronounced 'Arkânsâ.' I think no further examples are necessary to show that the original French pronunciation was much nearer 'sa' or 'saw' than 'saas.'

But this is only one, and the least, of the many reasons why the local pronunciation should be preserved. The present territory of the State of Arkansas was first settled by a colony of Frenchmen, sent out by the celebrated financier, John Law, about the year 1720. They settled in the country of the 'Arkansas' Indians at Arcansas Post, around which their descendants have lived until the present day, and which was the nucleus of all the early Anglo-American migrations into Arkansas, and from whom they got their pronunciation of the French geographic nomenclature. These people still pronounce the word 'Arkânsâ' and 'Arkansasaw.' They can see neither logic nor reason in 'Arkansasas.' Nor are they to be blamed that they memorialized the Legislature of the State through the Historical Society of Arkansas a few years since, when exasperated by the attempts of foreign euphonists to force the 'saas' pronunciation upon them, and to ridicule the only historical and phonetically correct pronunciation of the word, to set the matter at rest by legalizing the old pronunciation of the word, which was done by an almost unanimous resolution of the State Senate.

Have the customs and rights of the millions of Anglo-American and French-American pioneers and descendants in this region no

voice in the matter of the local nomenclature? Suppose that they, for the sake of euphony, should say that 'Worcester' (Mass.) should be pronounced 'Wor-ces-ter,' or 'Tehuacana' (Tex.) 'Tee-hu-a-can-a,' or 'San José' (Cal.) 'Saint Jo,' etc.: they would be termed ridiculous. If Anglo-Americans should agree to abandon the original pronunciation of all the French and Spanish spelled geographic terms of the South-west, I would agree with Mr. Dorsey, "that, when the regular Indian pronunciation cannot be maintained, let us use one that is euphonic English;" but as long as we pronounce the final syllable of the following partial list of French-American denominatives 'a' or 'aw,' all of which had the same origin and belong to the same category as 'Arkansas,' I shall oppose the singling-out of the latter word for euphonic experimentation: Attakapas, Tensas, Arkansas, Opelousas, Quapaw<sup>1</sup> (Kapas), Chickasaw<sup>1</sup> (Chickachas, Tchicachas).

Now, let us drop the word 'Arkansas' for the present, and take a look into the pronunciation of the geographic nomenclature of the western United States, which had its origin in the romance-speaking people, and its modifications by the Anglo-Saxon migrants, and lexicographers. Mr. Swinburne has given some fine illustrations of this in his able article 'The Bucolic Dialect of the Plains,' in a recent number of *Scribner's Magazine*; but there some general laws can be drawn from my observations in the Upper and Lower Mississippi valley, which I think are worthy of consideration. They are as follows:—

(1) In the north-west, the Latin-American geographic names, or Indian names spelled in the Latin languages, are generally spelled correctly by Anglo-Americans, but often mispronounced. Examples: 'Terre Haute,' 'Detroit,' 'Versailles,' 'Kansas,' 'Vincennes,' etc.

(2) Latin-American names of the south-west, or Indian names spelled in Latin languages, are often wrongly spelled by Anglo-Americans, but usually pronounced with approximate correctness. Examples: 'Bosque' ('Basque'), 'Turn Wall' (rare) ('Terre Noir'), 'Low Freight' ('L'Eau Frais'), 'Boggy' ('Bogie,' proper name), 'Tensaw' ('Tensas'), 'Prairie Dan' ('Prairie d'Ane'), 'Arkansaw,' 'Waco' ('Hueco'), etc.

It seems indeed paradoxical that the best educated and most literate population should have been least correct in the pronunciation; but when it is remembered that the Southern migrants procured their pronunciation by direct contact with the French and Spanish speaking people, and that the Websterian pronunciation was invented far from the scene, and in a day when modern languages received little attention, and the monopolizing classics pronounced even the mother Latin in the euphonic *veni, vidi, vici*, method, it was nothing but natural, that, "while Noah Webster in Connecticut was proposing single-handed to work over the English tongue so as to render it suitable to the wants of a self-complacent young nation," he should have fallen into the error of writing in the former editions of his valuable dictionary, "Arkansas, formerly pronounced and sometimes written 'Arkansaw.'"

It is gratifying to note, that, with the increased facilities for travel of late years, these erroneous arbitrary pronunciations are wearing away, and that Webster's latest edition gives the pronunciation 'Ar-kân-sa.'

ROBT T. HILL.

U.S. Geol. Surv., Jan. 17.

#### The Iroquois Beach.—A Chapter in the History of Lake Ontario.

I SEND you the following abstract of a paper read by me before the Washington Philosophical Society, Jan. 7, 1888.

Of the high-level beaches about Lake Ontario, the most important is that to which the writer has given the name 'Iroquois,' after the Indian confederation who used portions of it as a trail. Fragments of this beach have long been known, but these were first correlated in New York by Mr. G. K. Gilbert, who discovered that the variations in its height were due to the differential elevation of the earth's crust. These investigations have been carried around the Canadian side of the lake by the writer, whose studies upon the origin of the Great Lakes date back for a decade. He has also followed the beach beyond the observations of Mr. Gilbert, in north-

<sup>1</sup> The old French methods of spelling these words are given in parentheses. They are instances of words wherein the orthography has been sacrificed, and the pronunciation approximately maintained.

eastern New York, across the axis of maximum northern uplift, among the Laurentian ridges. In the old sea-cliffs in the region of Black River the author has found evidence of still older and greater differential elevation. At the head of the lake the height of the beach is 363 feet, south-east of the lake 441 (Gilbert), north-east, near Watertown, about 700, and at Trenton, Ont., 657 (barometric) feet, above the sea, in place of 247 feet,—the elevation of the modern lake. It is usually located within a few miles of the modern shore. At the south-eastern margin this beach sweeps around and includes Oneida Lake. North and east of Belleville, the lake, at this epoch, covered a large region, stretching to the Ottawa and down the St. Lawrence River. The maximum depth of the lake was 1,000 feet, in place of 738 feet, as at present; and of the outlet, 800, in place of a maximum of 240. The characters of the beach are described. Upon the northern side it rests upon drift-hills, but these are often replaced by more or less rocky shores upon the southern side. From Hamilton to Rochester, the eastward equivalent of the upward warping is three-fourths of a foot per mile, thence to Oneida Lake only one-fifth of a foot, and beyond a downward movement is indicated. At the eastern end of the lake the uplift increases from three feet to about five feet per mile, in proceeding northward. About the western end of the lake the northern equivalent of differential elevation ranges from 1.4 feet to three or four feet about Georgian Bay. The foci of elevation are south-east of James (Hudson) Bay. During the Iroquois epoch the lake was less than 140 feet above tide, and may have been at sea-level. In either case the outlet of the lake would have been 800 feet deep in places. There was no rock nor dirt barrier. Until further investigation shows the necessity, no other barrier will be assumed. In the Iroquois beach, remains of mammoths, elk, and beaver have been found, but no shells are known. There are lower beaches which are less perfectly developed, yet these show a decline of the warping forces. The Iroquois beach is coincident with the level of the Mohawk valley. Ontario was united with the other Great Lakes at a common level (the altitude being much lower than at the present day). This common lake (until the separation of Ontario) is here named Lake Warren, in honor of Gen. G. K. Warren, whom the writer regards as the father of lacustrine geology in America. Lake Warren is posterior to the last great ice epoch, and Ontario somewhat younger. Although the Ontario basin was somewhat warped before the Iroquois epoch, yet, so far, there is no evidence that the smaller basin formed an earlier separate lake.

In the study of the lakes the two great questions are, the origin of the valleys, and the cause of their closing into water-basins. As the valleys were shown long ago by the author to be preglacial, the second question is now being solved by the labors of Mr. Gilbert and the writer. Much unpublished information has been collected, and very much more is needed. There is now a dawn of light upon the theory and origin of the Great Lakes of North America.

J. W. SPENCER.

#### Weather-Predictions.

IN addition to Mr. Clayton's letter on this subject in *Science* for Jan. 13, I would state that I have never objected to a fair interpretation of 'my rules' so called, which, however, were an amplification of his own. Long before the predictions closed, I wrote him, suggesting that when one predicted 'rain,' the other 'threatening,' and the weather was actually 'fair,' the prediction nearer the truth should have the more weight. It is easy to see that the intent of any rules could only be a fair comparison between predictions. As I have already stated (*Science*, Dec. 30, p. 323), in two cases Mr. Clayton came nearer the actual weather, and in eight mine were the nearer. It was only after Mr. Clayton refused this proposition and any reference to a third person that I referred the matter to an impartial judge.

I am very glad indeed to find Mr. Clayton insisting, that, when predictions are made according to a certain rule, they should be verified thereby. In the case before us I have gone over all of Mr. Clayton's predictions in the *Boston Transcript*, and find, that, if he had modified them otherwise, they would have received the same verification by Upton's scheme as by mine, or, under the most lib-

eral interpretation, the difference would have been only two or three per cent.

I am very glad to know that Mr. Clayton verifies his predictions of three elements by only two of them, and this gives us an interesting verification of the predictions given in my first letter. If we count 'rain' = .01 of an inch or more, and apply this to Mr. Clayton's predictions, (1), we shall find that they verify 80 per cent; applying to mine, (2), 96 per cent. But Mr. Clayton's predictions were not made to be verified by this rule, so we must fall back on his official figures, which are 85 per cent.

If any thing has been brought out most clearly by this discussion, it is the absolute need of a thorough examination of the method of prediction in each case; and if a comparison is to be instituted, it should only be after a careful formulation of a method which shall give a fair test of the nearness of the prediction to the actual weather experienced, taking into account as far as possible the language used in each prediction. I know it to be a fact that a person may give the same prediction for a place in two different terms, and a seeming application of the same rules to both will give a difference of more than 35 per cent in the two verifications.

H. A. HAZEN.

Washington, D.C., Jan. 20.

### Children's Development.

APROPOS of the letter of 'G.' on children's development, in *Science* of Jan. 13, I was led to make the following contribution. When my little daughter was eighteen months old, I wrote down her vocabulary, as far as was possible, a number of days being spent in the process, so that it may be assumed that it is nearly complete. The total number of words is four hundred and sixty-nine, divided as follows:—

Common nouns.....	227	48.5%
Proper nouns (mostly names of persons).....	31	6.6%
Adjectives (including pronouns and articles).....	61	13.0%
Verbs.....	109	23.2%
Adverbs.....	22	4.7%
Prepositions.....	9	1.9%
Interjections.....	8	1.7%
Conjunctions.....	2	0.4%
	469	100

These were all words used by the child spontaneously, and in approximately their correct signification. Only one part of a verb is counted, unless the verbal stems of the different parts are distinct; plurals are not separately counted; and words used both as nouns and verbs are counted only once. The percentages are not materially different from those in the case cited by 'G.', but further contributions on this point seem desirable.

J. L. H.

Louisville, Ky., Jan. 18.

### Sections of Fossils.

MR. FOERSTE, in No. 258 of *Science*, quotes from letters from Professor Prestwich and Dr. Geikie in regard to sections of *Bryozoa*. In referring to these authors in No. 250 of *Science*, I did so simply to call attention to what they say in regard to rock-sections in general, not *Bryozoa* in particular. It is not worth while to say more upon this point. In regard to my reference to Dr. Nicholson's work, I never inferred "that Professor Nicholson does not believe in the use of these microscopic sections," but that he stated in numerous places in both his volumes on fossil corals that in many cases it is not possible to separate species on internal structure, so recourse is had to external features; and from this fact I contend that the internal structure of these organisms is not sufficient to separate species. The old school, if it may be so called, as opposed to the new, believe that internal characters are often misleading, and that external features may more safely be followed.

JOSEPH F. JAMES.

Miami University, Oxford, O., Jan. 16.

### The Influence of Forests upon Rainfall and Climate.

IN closing his valuable and interesting article in your paper of Jan. 6, entitled 'Do Forests influence Rainfall?' Mr. Henry Gannett says, "With these results in view, it seems idle to discuss further the influence of forests upon rainfall from the economic point of view, as it is evidently too slight to be of the least practical importance."

Aside from the beneficial influence of forests in the retention and saving of the water which falls, may it not be that there is an effect of the forest upon climatic extremes of heat and cold? This is well shown, I think, by the experience of western Michigan. During the early years of the settlement of the country, before the forests were destroyed, all the delicate fruits of temperate climates were successfully grown.

Since the forests are nearly gone, the tender varieties of peaches can no longer be raised, except in a few favored localities, on account of extreme winter cold; and the heat of our summers has been of late years as extreme as the cold of our winters.

H. D. POST.

Holland, Mich., Jan. 9.

### Is there a Venomous Lizard?

IN connection with the inquiry in *Science* of Jan. 13, as to the existence of a poisonous lizard (*Heloderma*), my own observations would corroborate the negative answer of your correspondent. I have had in my laboratory for five years a living specimen of the Gila monster (*Heloderma suspectum*), and during a portion of this time two specimens, both in healthy vigorous condition. In November, 1883, I presented a communication to the Kansas Academy of Science, maintaining that this species is not venomous. I have repeatedly placed young kittens in the same cage with these reptiles, and have allowed them to remain together for a week at a time. During these times the kittens were frequently bitten ferociously by the lizards, but with no worse result than the temporary swelling of the part bitten from the mechanical effect of the powerful pressure. This was at first surprising to me, as intelligent miners in New Mexico had often informed me that the mere breath of this lizard was fatal to man.

F. H. SNOW.

Lawrence, Kan., Jan. 19.

### Queries.

24. SILVER DOLLAR IN A POTATO.—Is there any likelihood of the truth of the following story found in a recent New York paper? On Friday last a young woman was engaged in boiling some potatoes. She tested nearly all of the Irish apples, and found that they had been cooked to the proper consistency save one. This particular 'spud' remained as hard as adamant, and, although she allowed it to boil for fifteen minutes longer than the others, it showed no signs of yielding. At last she succeeded in splitting the vegetable open, and in the centre she found a silver dollar with the date of 1886. The heart of the 'spud' was colored a blackish brown, but the outside presented a normal appearance. The silver dollar was black as ink.

### Answers.

22. WASP-STINGS.—Bumble-bees and honey-bees, as well as wasps, may be safely taken in the hand while holding the breath, provided the experimenter will catch only males, which are easily recognized by their long antennæ and their face-colors. Have your correspondents been sure that they captured female wasps, which alone have stings? In the autumn the males are most plentiful, and in that season one may easily show an astonished companion how safely a wasp can be handled while holding one's breath, and afterwards while breathing also; but in doing this, I always take care to catch the right kind of wasp first. My faith in the supposed safeguard has never been sufficient to try the experiment intentionally with female *Aculeata*. Will not Mr. Safford make the test in the spring, and report his results once more? He will then doubtless agree with *Life*, that the most important thing in holding a wasp is how to let go.

W. M. D.

Cambridge, Mass., Jan. 20.